

Orchids, Gingers and Bamboos: Pioneer work at the Singapore Botanic Gardens and its significance for Botany and Horticulture

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A BOTANIC GARDEN is essentially a museum of living plants maintained for botanical study. Out of that study comes new knowledge of various kinds, much of which can find an application in horticulture.

The maintenance of any garden involves thought about horticultural technique; and the maintenance of the great variety of plants in a botanic garden should result in experiment in techniques and in new understanding of the diverse cultural needs of the many plants concerned. Thus in a botanic garden there is a two-way traffic of knowledge and its application; new botanical knowledge finding applications in horticulture, new horticultural techniques aiding the cultivation of plants for botanical study.

A botanic garden may serve also as a park, but that is not its primary function. It should be the source and storehouse of new knowledge, both horticultural and botanical, which can find its application in parks and in private gardens; and without that constant pursuit of new knowledge the parks and gardens lose the impetus to progress.

Botanical study possible in botanic gardens may be divided broadly into two aspects: study of the structure and classification of plants, and experimental work of various kinds. The study of classification is basic to all other, and I would regard it as the primary function of a botanic garden. Such study may seem very theoretical; but it has immediate application in plant breeding and also in other ways. Plant breeding is one kind of experimental work which may be undertaken at a botanic garden; it can provide new kinds of plants for horticultural use. Other kinds of experimental work are concerned with the physiology of plants, and such may result in new knowledge useful in horticultural techniques.

The orchid family is the largest plant family (in number of species) in the Malayan region, and includes many beautiful plants which are valued horticulturally. Botanically, the great variety and complexity of floral structure presents very intricate problems to

the classifier. The botanist who explores the forests of Malaya for orchids (or other plants) cannot make a final study of them as he finds them; he needs to take them away for more detailed examination at leisure. He may either preserve them as herbarium specimens, or he may take living plants for cultivation. The herbarium at the Botanic Gardens, Singapore, is thus a vast storehouse of information, much of which has still not been thoroughly investigated. For orchids it is much more satisfactory to have living plants in cultivation, and to examine the fresh flowers, as dried ones lose some of their characteristic shape as well as their colours.

Mr. H. N. Ridley, who was Director of the Gardens from 1888 to 1912, had made a special study of the orchid family before his arrival in Singapore, and during his many travels of botanical exploration he brought to the Gardens a large number of orchid plants, many of which he described as new species, preserving also specimens of them. He also had the services of an excellent artist (Charles de Alwis) who made accurate coloured drawings of the plants and their flowers. Thus the records of Mr. Ridley's study of native Malayan orchids are preserved in Singapore in the form of specimens, illustrations and descriptions. Upon these records depends stability in the use of names; if a name is to be useful it must always mean the same thing.

Similar work on orchids was carried out in neighbouring countries (India, Siam and Indo-China to the north, and in Indonesia). In order that there shall not be confusion and duplication in the use of names, it is necessary to correlate study of plants in Malaya with those in the surrounding countries (where many of the same species occur, along with others). This has been achieved by the accumulation in Singapore of a valuable botanical library and by exchange of specimens.

The most important later collector and describer of new orchids in Malaya was Mr. C. E. Carr, a rubber planter who made this work his chief recreation. He used the herbarium and library at the Botanic Gardens, Singapore, and contributed specimens which he had gathered. After his death, his many manuscript notes and drawings were also acquired for the Gardens, and are a most valuable record of his work.

In this kind of way a great body of records concerning the native orchids in Malaya and neighbouring countries was built up. Much of this recorded knowledge became of great importance when the breedings of new orchids, for use as garden plants and for their cut flowers, was begun about the year 1928. It is true that only a

small proportion of orchid species are useful for exploitation in this way; but for a proper appreciation of the possibilities, the full survey is necessary, showing the more useful plants in perspective as parts of a whole, and thus showing their own inter-relations. Such a survey also shows what other plants exist, not yet in cultivation, which might be valuable for breeding purposes.

The impetus to orchid breeding was provided by Mr. John Laycock, who imported to Singapore many species from neighbouring countries, thus providing valuable breeding stock, and by a visit from Prof. H. Burgeff, a pioneer of the study of orchid seedlings. Up to that time, no orchid seedlings had been raised in Singapore by modern methods of pure culture which ensure a high percentage of germination; and nobody had any experience of the behaviour and cultural needs of young orchid seedlings newly removed from culture tubes. As a result of trials and errors, methods of dealing with these plants were gradually discovered, and the first seedlings flowered in 1931 (*Spathoglottis* × *Primrose*). A succession of new hybrids followed, and at the time of the Japanese occupation of Singapore some 4,000 seedlings were in pots at various stages of development, in addition to those in flasks and to larger plants. A considerable proportion of these plants was maintained during the occupation period, though there were many losses, and some new crosses were made. Methods of raising seedlings on agar-agar prepared directly from seaweeds were developed. Progress after the war was rapid, and today the production and culture of fine new orchids has become of considerable commercial importance, as well as a recreation for a large number of people.

The significance of this development is that nature provides comparatively few kinds of orchids well suited to the local climate in vigour of growth, and in freedom of flowering, which have also the qualities of floral form and durability required for horticultural purposes. The production of large numbers of new kinds of plants by crossing, by new seedling techniques, and by selection of the best, has resulted in a complete transformation of Singapore gardens, and in the production of a wealth of cut flowers throughout the year in considerable variety, and of kinds previously unknown. It is an example of the kind of change which is possible also with other families of plants.

The Ginger family provides a rather different story. There are about 150 known species of the family in Malaya, most of them wild in the forests, a few others being cultivated in villages for flavouring food or for medicine. Nearly all plants in the family have aromatic properties, and more of them are potentially useful

than are yet in use. Little or no breeding or selection, even of the kinds now in use, has yet been undertaken. The family has its main centre of distribution in Malaysia, and the only full botanical monograph upon it was prepared fifty years ago, in Europe, from imperfect material. This monograph is very unsatisfactory, and a careful study of native Malayan species, made in recent years at Singapore, led the way to revised concepts of basic classification. This study was possible through field and garden work similar to that undertaken for orchids, as above described. The flowers of the ginger family are delicate and short-lived, and also complex in structure, so that dried specimens are difficult to interpret; one needs to see either fresh flowers or specimens preserved in alcohol. The revised survey of the family in Malaya gives a full statement on classification as well as detailed descriptions of all species known to occur in the country. It was in part based on pioneer studies made of some allied species in Java; and in its turn the Malayan survey has helped in the understanding of other Indonesian members of the family. This study, made in Singapore through a combination of botanical and horticultural activities (especially the collections of plants and specimens made by Mr. E. J. H. Corner) is basic to any future exploitation of this family, which contains so many useful plants.

Bamboos are used daily, for many purposes, by almost all people in Malaya; there are no other plants which have such varied uses. But until recently no descriptive account of the various kinds of Malayan bamboos had been published. The reason is that there are many peculiar difficulties in the botanical study of bamboos. In the first place, botanical classification must be based on floral structure, and most bamboos flower rarely (one plant from northern Malaya, in cultivation in Singapore for fifty years, has never been known to flower). Thus it is obviously necessary also to study other parts of the plants, so that recognizable descriptions, based on the non-flowering parts, may be drawn up. In practice, such descriptions are not easy to make, and no real attempt to make them was tried in Malaya until quite recent years. This attempt was only possible because from time to time native Malayan bamboos of various kinds, and also species from India and elsewhere outside Malaya, had been brought into cultivation in the Botanic Gardens, Singapore. These plants were available for detailed study at leisure, and their flowering could be observed when it occurred. As a result of such study, further field work could be effectively carried out, and resulted in more plants being brought into cultivation, as well as in specimens and in recorded observations on plants found in various parts of Malaya.

The results of this first survey of Malayan bamboos, made possible by the cultivation of plants in the Botanic Gardens, Singapore, have now been published. It is hoped that this publication may be made the basis for a comparative study of the useful characters of Malayan bamboos. In the north of Malaya there are many kinds of native bamboos which have never been brought into cultivation, and there have been no experiments to test the usefulness of particular kinds of bamboos for different purposes, or to select the best kinds for propagation and wider use. Here is a subject which touches the daily lives of all people living in the rural parts of Malaya, basic work on which has been carried out at the Botanic Gardens, Singapore, and which awaits that further investigation which is outside the scope of the Botanic Gardens.